

The effect of document types and sizes on the scaling relationship between citations and co-authorship patterns in management journals

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Abstract The aim of this paper is to explore the power-law relationship between citation-based performance (CBP) and co-authorship patterns for papers in management journals by analyzing its behavior according to the type of documents (articles and reviews) and the number of pages of documents. We analyzed 36,241 papers that received 239,172 citations. The scaling exponent of CBP for article papers was larger than for reviews. Citations to articles increased $2^{1.67}$ or 3.18 times each time the number of article papers published in a year in management journals doubled. The citations to reviews increased $2^{1.29}$ or 2.45 times each time the number of reviews published in a year in management journals doubled. The scaling exponent for the power-law relationship of citation-based performance according to number of pages of papers was 1.44 ± 0.05 for articles and 1.25 ± 0.05 for reviews. The citations to articles increased faster than citation to reviews. The scaling exponent for the power-law of citation-based performance to co-authored articles was higher than single-authored articles. For reviews the scaling exponent was the same for the relationship between citation based performance and the number of reviews. Citations increased faster in single authored reviews than co-authored reviews.

Keywords Allometry · Academic collaboration · Fractal · Power-law · Scale independent · Self-similar

Introduction

Over 40 years, the average number of authors of scientific papers has doubled (Ausloos 2013). This trend fostered academic interest on the study of the behavior of co-authorship patterns, particularly the relationship between citations and co-authorship (Hartley 2015;

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Khor and Yu 2016; Rousseau and Ding 2016; Thijs et al. 2015; Wang et al. 2015). Scientists from different academic disciplines have turned their interest into the study of co-authorship networks in their respective research areas in the past 25 years. In the Web of Science Category *Information Science & Library Science* 591 articles published in 71 journals disseminated findings about scientific collaboration. The journal *Scientometrics* accounts for 34% of the overall scientific output on the subject matter. 57% of the papers were published in the last seven years suggesting exponential growth (Ronda-Pupo and Katz 2016c).

The increase of number of studies analyzing the possible influence that co-authorship has on the impact of articles is an ongoing area of research. Recent published findings reported the existence or the absence of a relationship between collaboration and the impact of papers (Gazni and Thelwall 2016; González-Teruel et al. 2015; Hartley 2015; Khor and Yu 2016; Rousseau and Ding 2016; Thijs et al. 2015; Wang et al. 2015).

Studies of science systems have shown they are complex, adaptive systems with emergent properties frequently characterized by power law distributions and correlations (Katz 2016). Archambault et al. (2011) found that collaboration intensity has a power-law correlation with size measured using numbers of documents. Moreover, the larger an entity tends to collaborate less intensely with outside partners. Katz (2000) suggested that one could derive performance indicators by dividing observed values by expected values calculated using a power law regression on the correlation data addressing the non-linear properties of collaboration (Archambault et al. 2011).

Mingers (2008); Mingers and Burrell (2006); Mingers and Lipitakis (2010); Mingers and Xu (2010) have analyzed the impact of management publications through traditional scientometric indicators such as, H index, number of documents and number of citations. A few studies have analyzed the relationship between citation-based performance (CBP) and co-authorship patterns in management articles using a scale independent approach. Ronda-Pupo and Katz (2016a) found a power law relationship between CBP and co-authorship patterns of articles in management journals with a scaling exponent of 1.89 ± 0.08 . The aim of this paper is to explore the power law correlation between citation-based performance and co-authorship patterns of papers published in Fifty-two top-tier management journals by type and size measured using (1) number of documents, S_d , and (2) number of pages of documents, S_p . To achieve the goal, we analyzed 36,241 papers published between 1980 and 2012, inclusive.

Background

Katz (1999, 2000, 2005) found strong evidence that the science system is characterized by a size-dependent cumulative advantage. van Raan (2013, p. 1) says “Cumulative effect implies a nonlinear increase of impact with increasing size, demonstrated by the finding that the number of citations as a function of number of publications exhibits a power law dependence with an exponent larger than 1”. The Matthew Effect in science is the common observation that in a scientific research area most of papers receive none or a few citations while a few papers get many citations becoming the core of the citation network. This behavior tends to produce a heavy tailed distribution described by a power law distribution (de Solla-Price 1976). Furthermore, a power law correlation is frequently found between impact (measured using citations) and size across members of a group (e.g. journals, fields, institutions, etc.).

The expansion of the scientific literature has produced an increase in the number of review papers (Ketcham and Crawford 2007). Ketcham and Crawford (2007) reported that the pathology literature is proliferating at a rapid rate; from 1991 to 2006, the total number of original articles increased 2.3-fold, while the number of reviews increased 5.6-fold. Also, they reported that articles received more citations than reviews. Conversely, Mingers and Lipitakis (2010) found that management reviews papers attract more citations than articles. These studies used nonparametric tests to reach the conclusions. They did not quantify the difference between the CBP for articles and reviews. We expect there to be power law correlation between citations and numbers of article or review documents having exponents with different values $\alpha > 1$.

Recent studies have accounted for the relationship between collaboration and citation impact for countries (Aman 2016; Rousseau and Ding 2016; Zhang et al. 2016), for specific scientific fields (Costa et al. 2016; Levitt and Thelwall 2016) or for institutions (Gazni and Thelwall 2016; Khor and Yu 2016). All studies highlight the importance of collaboration on the impact and visibility of scientific research.

Recently Coccia and Bozeman (2016) using the allometric approach reported a positive allometry ($\alpha > 1$) in international collaboration patterns in thirteen fields of research. Although authors did not account for the possible scaling relationship between collaboration patterns and citation based performance for the fields they analyzed. Previous studies have found a power law correlation between CBP and scientific collaborative patterns for articles in management journals (Ronda-Pupo and Katz 2016a). Also, a power law correlation between CBP and international collaboration patterns was found for the Cuban science system (Ronda-Pupo and Katz 2016b). Moreover, a scaling correlation was found between citations and co-authored patterns across natural science fields (Ronda-Pupo and Katz 2016c). We expect to find a power law correlation between impact and co-authorship patterns in management journals whose exponents vary according to document type and size (S_d and S_p).

Falagas et al. (2014) analyzed articles published in major General Medicine journals. They found that article S_p was correlated with the number of citations. Also, Mingers and Lipitakis (2010) reported similar results for management. They found that the S_p correlates with the number of citations. We did not find any studies that analyzed the scaling relationship between S_d and S_p . We will explore the possible existence of a power law correlation between S_d and S_p for article and review document types according to their co-authorship/single-authorship patterns.

Methods

The structure of a given scientific community emerges from its research activity. Its fingerprint is the knowledge it generates and disseminates mainly through peer-reviewed papers in journals. These peer-reviewed papers have properties such as length, number of authors or age. The peer-review papers can be disaggregated into domains, fields, countries or regions. The distribution of peer-reviewed paper published by scientific communities is known to show scale invariant properties (de Solla-Price 1963; Katz 2016). The distribution of citations to these papers have scale invariant properties too (Brzezinski 2015; Clauset et al. 2009; Katz 2016; Newman 2005).

Any pair of coupled exponentially growing or decaying processes show a scaling correlation (Katz 2005; Sahal 1981). The scaling exponent for a power law correlation

between two exponentially growing functions is given by the ratio of the exponential exponents. That is, $\alpha = \beta_2/\beta_1$ where $x \approx e^{\beta_1 t}$ and $y \approx e^{\beta_2 t}$ are the exponentially growing parameters (Katz 2012). This approach was used in (Coccia and Bozeman 2016) to analyze the evolution of international collaboration patterns. For example, if we examine the scaling correlation between the growth of citation-based performance (CBP) and S_d (number of reviews) published between 1980 and 2012 in management journals the result will show CBP and S_d grew exponentially given by $CBP \approx e^{0.1678t}$ and $S_d \approx e^{0.1308t}$, respectively. The mathematics shows that the ratio of these $0.1678/0.1308 = 1.28$ should be the value of the scaling exponent between this pair of parameters. The calculated value for these variables seen in Table 4 is within the error range of the measured scaling exponent 1.29 ± 0.05 determined using OLS on log transformed data. For the present study we follow the power-law approach used in Ronda-Pupo and Katz (2016c) to study co-authorship patterns.

$$CBP = kc^{\alpha} \quad (1)$$

The dependent variable *CBP* is a measure of impact. The independent variable *c* is a measure of size (S_p , S_d); for example, the number of articles or reviews published in a year in a journal or total number of pages containing articles or reviews published in a year. The model becomes a line by the log transformation of both variables. The logarithmic transformation of the model is expressed as a simple linear relationship, where *CBP* stands for citation-based performance, $\log(k)$ is a constant (intercept) and α is the scaling factor (slope of the log–log regression line).

$$\log(CBP) = \alpha \log(c) + \log(k) \quad (2)$$

The parameters of the correlation *k* and α are calculated with the Ordinary Least Squares (OLS) method because is the method that produces fitted values with the smallest error (Leguendre and Leguendre 2012). Also, because OLS is asymmetric (Smith 2009). We are interested in predicting CBP on the independent variables analyzed.

The exponent of the power law correlation is considered a measure of the magnitude of the Matthew Effect (Katz 1999; Ronda-Pupo and Katz 2016c; van Raan 2013) mathematically described in the following way. Given a scaling correlation $f(x) = kx^{\alpha}$ then for $\alpha > 1$ $f(x)$ increases non-linearly with x indicative the correlation is super linear and its magnitude is a measure of the Matthew Effect or cumulative advantage (Katz 2006; van Raan 2013). Citations scale positively with the size of the system. For researchers from biology and ecology communities positive allometry.

When $\alpha = 1$, both citation-based performance and size of the system grow linearly at the same rate. There is no cumulative advantage of one variable over the other. There is isometry.

If the scaling exponent $\alpha < 1.0$ the correlation is sublinear and its magnitude is a measure of the inverse Matthew Effect or cumulative disadvantage (Katz and Cothey 2006). Citations scales negatively with the size of the system. There is negative allometry.

Now assume we find $f(x)' = kx^{\alpha'}$ where $f(x)' > f(x)$ indicating that the cumulative advantage for $f(x)'$ is larger than the cumulative advantage of $f(x)$. This can only be true if and if only $\alpha' > \alpha$ the magnitude of the exponent is proportional to the increase in the Matthew Effect (Ronda-Pupo and Katz 2016c).

Definition of variables

Number of documents (S_d): the number of documents published in management journals each year of the time frame of the study.

Number of pages (S_p): the number of pages of documents published in management journals each year of the time frame of the study. It appears in the field PG of each paper in ISI classification.

Citation-based performance (CBP): the number of citations received by the papers published in each year. We used a 4-year citation window. The CBP of the papers published in 1980 is the sum total of citations received from 1980 through 1983. This ensures that the papers have the same fix citation window.

Document type: the classification assigned by ISI Web of Science to the document. It appears in the DT field of each paper in ISI classification.

Co-authored paper: number of documents published in a journal with more than one author.

Single-authored paper: number of documents published in a journal with only one author.

Data source

The data for the study consists of documents published in journals listed in the Journal Citation Reports in the category “Management”. We defined two inclusion criteria to select journals (1) the journal should cover all the time frame 1980 through 2012, this criterion ensures that the increase in the number of papers published yearly in the discipline is not a consequence of the exponential increase of journals in the academic field (Mabe, 2003) (2) the documents should appear in English Language. This decision is based on results of previous studies on the citation advantage of papers published in English language journal, e.g. see (López-Navarro et al. 2015; Ronda-Pupo and Diaz-Contreras 2014; Tietze and Dick 2012).

We used the publication type articles and reviews to test our hypothesis. These publication types were used for the following reasons: (1) they are peer-reviewed, (2) they are a primary route for disseminating new knowledge in most scientific disciplines (Adams and Gurney 2013), and (3) previous studies suggest the existence of a relationship between reviews and citations to them in management journals (Mingers and Lipitakis 2010).

We used Web of Science™ Core Collection. Tag Advance search SO = ‘journal names’ Refined by: Document Types: (Article OR Review). To ensure that the review is not a book review and the proceeding is a journal paper we ran a second filter to verify the document types Review and proceedings paper by the ISI field PJ (not available on-line). Timespan: 1980–2012, inclusive, LA = English. Indexes: SSCI-EXPANDED, SSCI, A&HCI.

Results

The JCR 2015 edition includes 193 journals in the category management. Fifty-two journals (27%) (see “Appendix” in Table 5) met the inclusion criteria of first published 1980 or earlier. The 88.5% of these journals come from USA (55.8%) and UK (32.7%). Figure 1 shows the distribution according to JCR’s quartile. Of the Fifty-two journals

included in the analysis, twenty-one (42.3%) journals are in the first quartile, thirteen (25%) in the second quartile, nine (17.3%) in the third quartile and eight (15.4%) in the fourth quartile. In descending order, the five journals that published the most reviews were *Academy of Management Review* 182 (11%), *Journal of Management* 181(11%), *Journal of Management Studies* 163 (10%), *Journal of Applied Psychology* 125 (7%), *Strategic Management Journal* 121 (7%) and, *Administrative Science Quarterly* 85 (5%). These 6 journals accounted for 50% of the review papers included in the study. This result is consistent with Ketcham and Crawford (2007) findings for pathology journals and results presented by Ausloos (2013) on the sustained increase of review papers in scientific literature.

A search on the Web of Science with the criteria posed for the query retrieved 86,193 documents yielding 58,882 articles and reviews that appeared in English language. Only 36,241 (62%) papers included all the information in the address field. Table 1 shows the number of articles and reviews published in the sampled management journals between 1980 and 2012, inclusive.

Figure 2 shows the sustained increase trend of the number of articles and reviews published in management journals in the time frame of the study.

Table 2 presents the ratios of articles and reviews according to their co-authorship/single-authorship patterns. The following highlights summarize the results:

- Reviews whether they are co-authored or single-authored are about 16% longer than articles.
- Co-authored articles or reviews are about 2% longer than single-authored articles or reviews.
- The ratio CBP/S_d for reviews is about 2.7 the ratio for articles. This pattern is similar for co-authored and for single-authored documents.

Normality test for all log-transformed variables was checked (Shapiro–Wilk) and met. Also, constant variance passed for all datasets. Like Coccia and Bozeman (2016) we used Student's *t-distribution* to verify whether the scaling exponents of the power law correlation indicates there is a correlation between the variables under analysis. Tables 3 and 4 show the values with the associated probability.

Table 3 and Figs. 3, 4 and 5 shows the exponents for the relationship between CBP and co-authorship and single-authorship patterns according S_d , S_p considering articles and reviews together. Table 4 shows the exponents for articles & reviews separately.

The following highlights summarize the results:

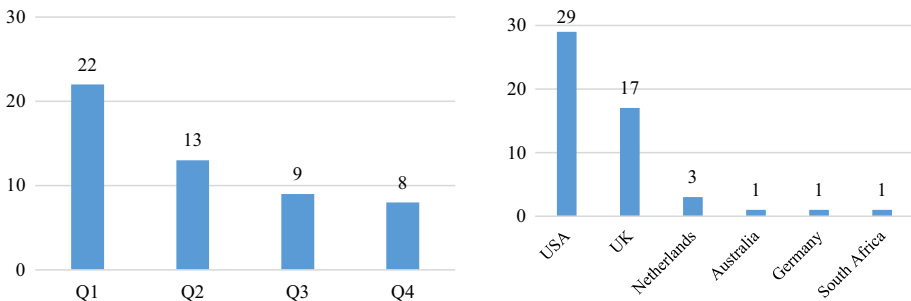


Fig. 1 Number of journals included in the study organized according quartile and country of origin. Q = quartile

Table 1 S_p , S_d and CBP according document type

Datasets	Articles			Reviews		
	S_d	S_p	CBP	S_d	S_p	CBP
Overall	34,545	516,701	211,405	1696	41,036	27,767
Co-authored	28,097	421,685	179,010	1331	33,141	23,746
Single-authored	6448	95,016	32,395	365	7895	4021

Fig. 2 Number of articles and reviews published in management journals 1980: 2012

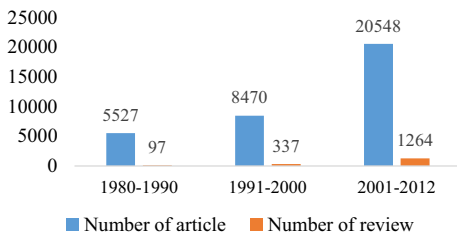


Table 2 Various ratios for articles and reviews

Datasets	Articles			Reviews		
	CBP/ S_d	CBP/ S_p	S_p/S_d	CBP/ S_d	CBP/ S_p	S_p/S_d
Overall	6.12	0.41	14.99	16.35	0.68	24.17
Co-authored	6.37	0.42	15.01	17.81	0.72	24.86
Single-authored	5.02	0.34	14.89	11.02	0.51	21.63

Table 3 Exponents of the power law correlation between CBP and co-authorship/single-authorship patterns for articles and reviews combined

Variables	Datasets	Article + reviews				
		α	SD	r^2	t	p
1. CBP versus S_d	Overall	1.67	0.05	0.98	751.8	0.00
	Co-authored	1.74	0.04	0.98	751.8	0.00
	Single-authored	1.52	0.06	0.95	286.9	0.00
2. CBP versus S_p	Overall	1.44	0.04	0.98	751.8	0.00
	Co-authored	1.48	0.04	0.97	493.5	0.00
	Single-authored	1.33	0.05	0.96	364.4	0.00
3. S_p versus S_d	Overall	1.15	0.02	0.99	1526.8	0.00
	Co-authored	1.17	0.02	0.99	1526.8	0.00
	Single-authored	1.14	0.02	0.99	1526.8	0.00

- The scaling exponent for the correlation between CBP and S_d is higher for co-authored papers than to single-authored.
- The scaling exponent for the correlation between CBP and the S_p of documents published is higher for co-authored papers than to single-authored.

Table 4 Exponents of the power law correlation between CBP and co-authorship/single-authorship patterns

Variables	Dataset	Article					Review				
		<i>Alpha</i>	<i>SD</i>	r^2	<i>t</i>	<i>p</i>	<i>Alpha</i>	<i>SD</i>	r^2	<i>t</i>	<i>p</i>
1. CBP versus S_d	Overall	1.67	0.05	0.97	509.46	0.00	1.29	0.05	0.95	3.02	0.00
	Co-authored	1.74	0.05	0.98	7.76	0.00	1.33	0.05	0.95	2.05	0.02
	Single-authored	1.51	0.07	0.95	2.87	0.00	1.33	0.02	0.86	7.78	0.00
2. CBP versus S_p	Overall	1.44	0.05	0.97	509.46	0.00	1.25	0.05	0.94	2.56	0.01
	Co-authored	1.48	0.05	0.97	5.09	0.00	1.26	0.06	0.94	8.16	0.00
	Single-authored	1.32	0.05	0.96	3.64	0.00	1.38	0.11	0.86	7.10	0.00
3. S_p versus S_d	Overall	1.15	0.02	0.99	1576.04	0.00	1.01	0.03	0.97	5.16	0.00
	Co-authored	1.16	0.02	0.99	1.58	0.10	1.02	0.04	0.96	8.26	0.00
	Single-authored	1.15	0.02	0.99	1.58	0.10	0.94	0.03	0.97	3.98	0.00

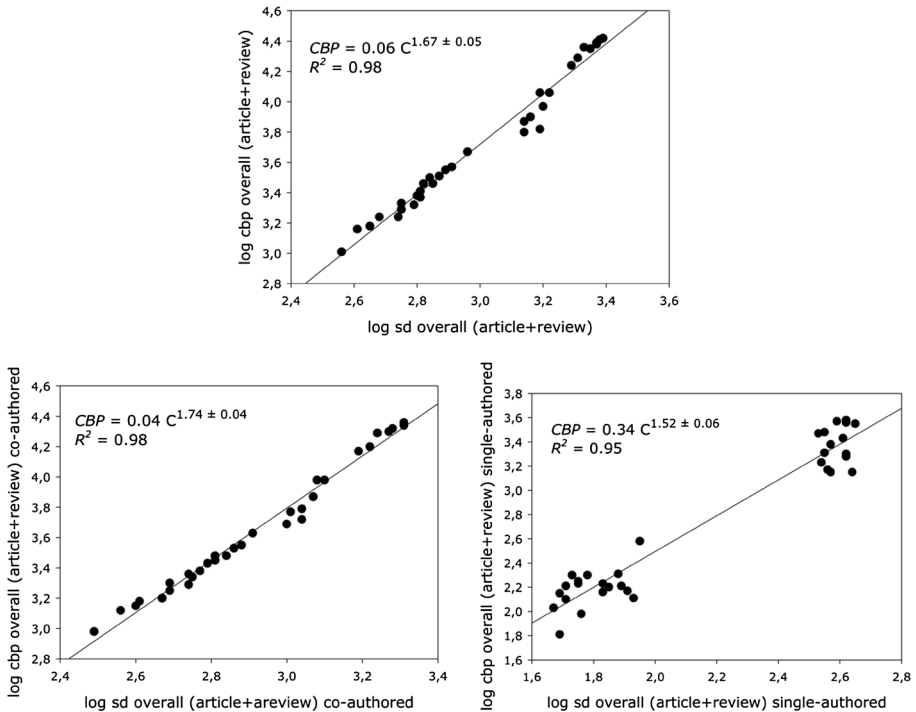


Fig. 3 The scaling relationship between CBP and S_d for overall documents considering co-authored and single-authored articles + reviews

- The scaling exponent for the correlation between S_p of documents and S_d is >1 indicating that the number of pages in management journals grows faster than the number of articles and reviews.

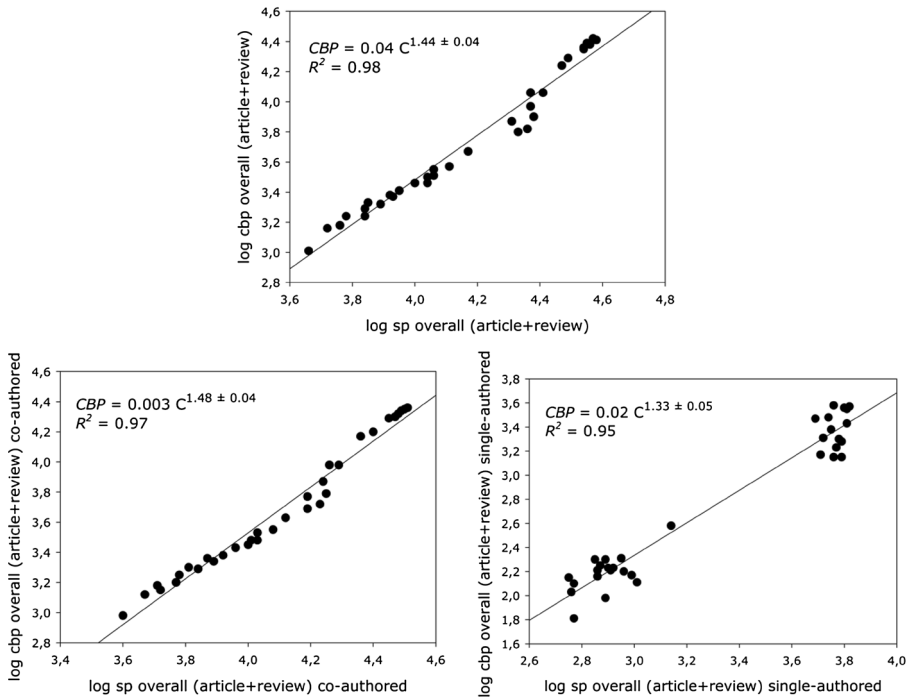


Fig. 4 The scaling relationship between CBP and Sp for overall documents considering co-authored and single-authored articles + reviews

The following highlights summarize the results of the exponents for the relationship between CBP and co-authorship/single-authorship patterns according to the S_d , S_p and to document types (see Figs. 6, 7, 8).

- The Matthew Effect of correlation between CBP Vs S_d of articles is stronger than for reviews in overall and co-authored datasets. A similar result for the variables CBP Vs S_p and for S_p Vs S_d .
- The Matthew Effect of the correlation between CBP Vs S_d of co-authored articles is stronger than for single-authored articles but no differences were observed between co-authored and single-authored reviews.
- The Matthew Effect of correlation between CBP Vs S_p in co-authored articles was stronger than single-authored articles. Conversely, the Matthew Effect of the correlation between CBP Vs S_p in single-authored reviews was stronger than for CBP Vs S_p in co-authored reviews. This result suggests that prominent authors in the field tend to formulate new propositions through single-authorship in reviews documents and also with a reasonable economy of pages in the top tier journals.
- The scaling exponent for the correlation between S_p and S_d is higher in overall articles than in overall reviews. This result suggests that the number of review pages does not grow as fast as the number of articles pages.
- The scaling exponent for the correlation between S_p and S_d in co-authored articles was about the same than single-authored articles, while the scaling exponent for the correlation between S_p and S_d in co-authored reviews was higher than single-authored reviews. Single-authored reviews showed an inverse Matthew Effect since the exponent

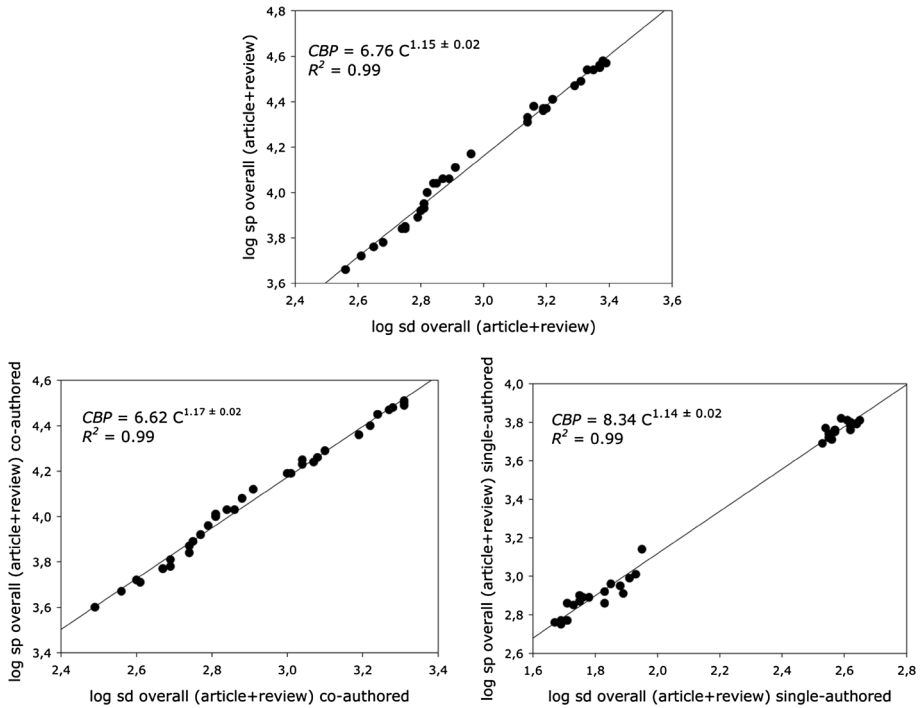


Fig. 5 The scaling relationship between S_p and S_d for overall documents considering co-authored and single-authored articles + reviews

<1 indicating that a doubling in the number of single-authored reviews only increase S_p $2^{0.94 \pm 0.03}$ or 1.91 times.

Discussion and conclusion

Contrary to results reported by Mingers and Xu (2010) that reported a citation cumulative advantage of reviews over articles in management journals, the results of the present study suggest:

- The CBP to both document types, articles and reviews scales with time with scaling exponent >1 indicating CBP increases faster than documents types published yearly in management journals.
- The Matthew Effect for CBP for articles is higher than for reviews suggesting articles contribute more than reviews to the yearly citation increase of the scientific output in the management discipline. CBP for article papers increased $2^{1.67 \pm 0.05}$ or 3.18 times when the number of articles published in a year doubled while the CBP for reviews increased non-linearly $2^{1.29 \pm 0.05}$ or 2.45 times when the number of reviews published in a year doubled. The results support Ketcham and Crawford (2007) results for pathology literature. These authors also found that articles received more citations than reviews.

The hypothesis on the common believe across scientific disciplines on the citations advantages of reviews over articles is not supported with the data analyzed. On this believe the Annual Meeting of the American Society for Cell Biology (ASCB) in San Francisco,

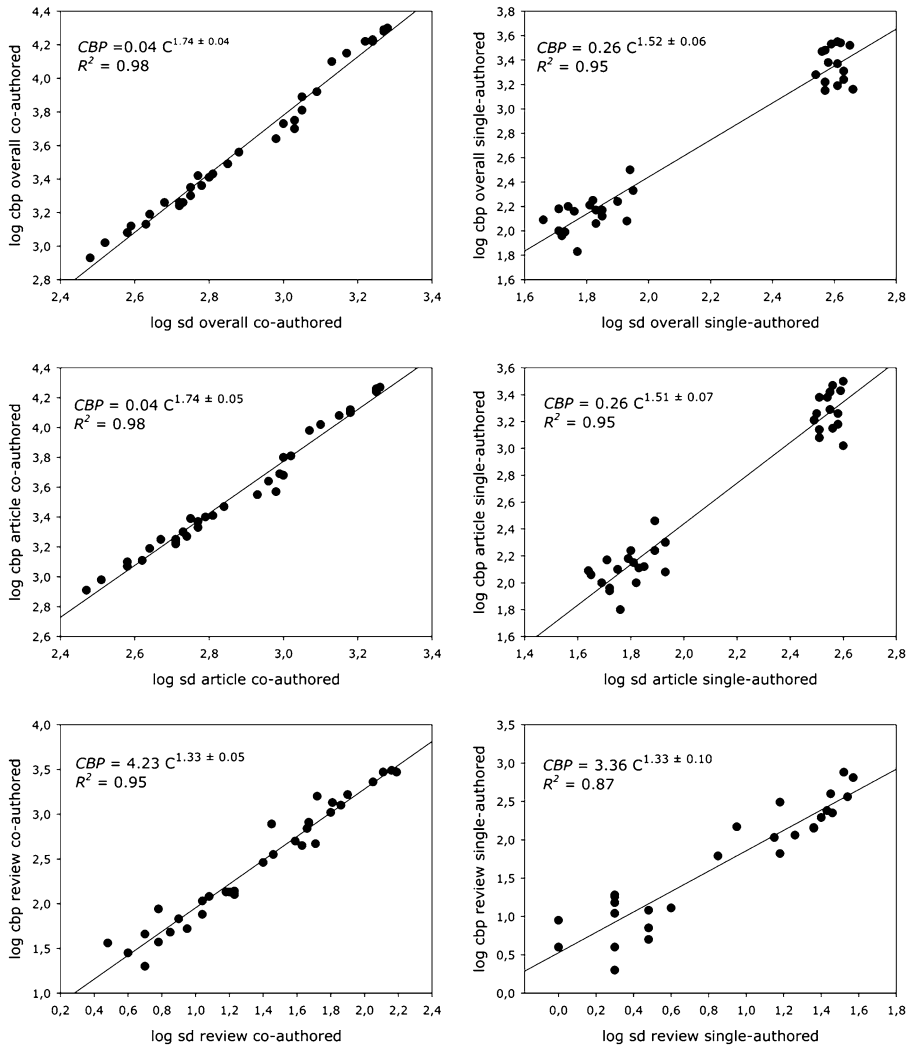


Fig. 6 The scaling relationship between CBP and S_d for overall, articles and reviews considering co-authored and single-authored patterns

on December 16, 2012. A group of editors and publishers of scholarly journals prepared a document called the “San Francisco Declaration on Research Assessment: Putting science into the assessment of research” (ASCB 2015). In the recommendations, they suggested that publishers should “where appropriate, mandate the citation of primary literature in favor of reviews in order to give credit to the group(s) who first reported a finding”. The practical implication of this result suggests that comparing the cumulative advantage between document types should be done considering scaling with time or a point in time using a fix citation window. Also, it would be important to measure the Matthew Effect comparing CBP of articles and reviews before and after the San Francisco Declaration on Research Assessment using the Natural Sciences domain to measure a possible effect of the San Francisco Declaration on citation trends.

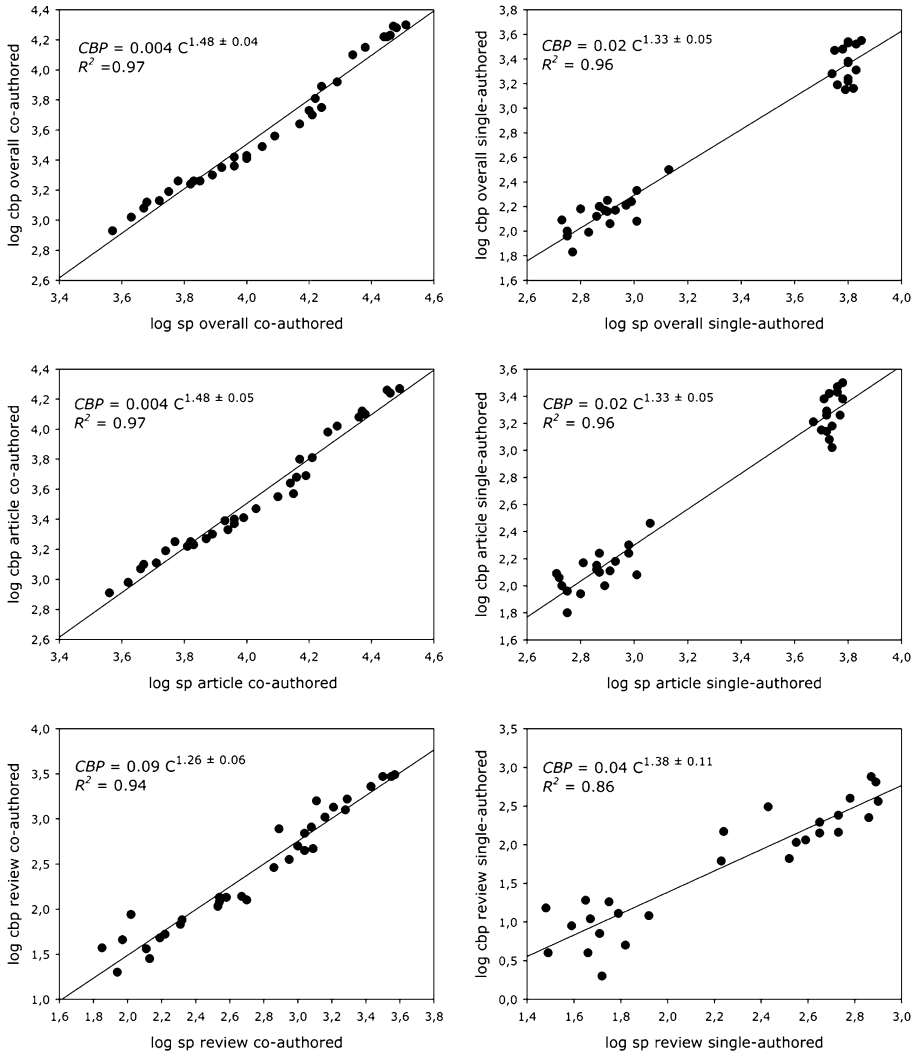


Fig. 7 The scaling relationship between CBP and S_p for overall, articles and reviews considering co-authored and single-authored patterns

The results show that the Matthew Effect for the relationship between CBP and S_d is higher for co-authored articles than single authored ones. CBP to co-authored articles increase with S_d $2^{1.74 \pm 0.05}$ or 3.34 times when the number of co-authored articles in a year doubled while CBP to single-authored articles increased with S_d $2^{1.51 \pm 0.07}$ or 2.85 times when the number of single-authored articles in a year doubled. This result supports previous findings on the cumulative advantage of citation-based performance of collaborative articles (Ronda-Pupo and Katz 2016a, b, c). Collaboration seems to foster higher impact research articles. Developing academic collaborative activity might enhance a group’s absorptive capacity and enrich their intellectual capital.

The analysis of the Matthew Effect behavior for the relationship between the CBP and S_d in review papers show different results. CBP of co-authored reviews is about the same

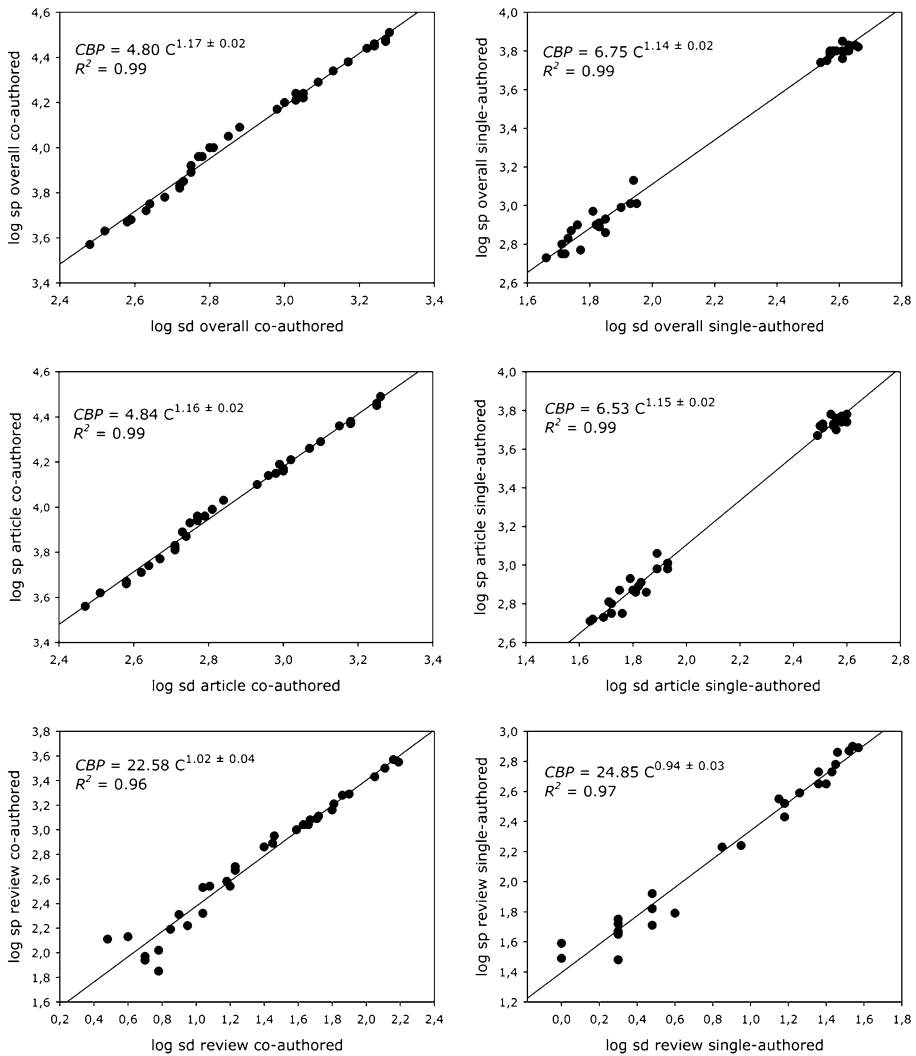


Fig. 8 The scaling relationship between S_p and S_d for overall, articles and reviews considering co-authored and single-authored patterns

than single authored ones. The co-authorship patterns in review papers does not show a cumulative advantage in favor of one of them. The scaling exponents are about the same.

Articles are 14.9 pages long on average and reviews 24.1 pages long. The results show that the CBP for articles increased with S_p $2^{1.44 \pm 0.05}$ or 2.71 times when the number of article pages in a year in management journals doubled. The CBP for reviews increased $2^{1.25 \pm 0.05}$ or 2.38 times when the number of review pages in a year in management journals doubled. This result suggests that the length of papers has a positive effect on the Matthew Effect of CBP for both articles and reviews. Results suggest that the Matthew Effect of CBP for articles length is stronger than for review length.

The results suggest that the Matthew Effect for the relationship between CBP and S_p for single author reviews is higher than for co-authored reviews but it is also higher than to

single-authored articles. CBP to single authored reviews increase with $S_p 2^{1.38 \pm 0.11}$ or 2.60 times when the number of single authored reviews in a year doubled while CBP to coauthored reviews increased with $S_p 2^{1.26 \pm 0.06}$ or 2.39 times when the number of co-authored reviews in a year doubled. The CBP to single authored articles increased with $S_p 2^{1.32 \pm 0.05}$ or 2.55 times when the number of co-authored articles in a year doubled showing a cumulative advantage over single authored or co-authored reviews. This behavior may be due to the fact that single authored reviews and articles are usually written by senior researchers that are highly internationally recognized among the management scientific community. They usually introduce new research topics into the main streams lines of research of the discipline and they rapidly become trending research themes in the top tiers journals of the discipline. They foster new lines of research within Ph.D. programs in business schools and new entrant researchers replicate their models in their studies.

This research suggests possible new lines of investigation. It would be interesting to test these hypotheses in other domains such as natural sciences, applied sciences or health sciences. Other possible line of research is the study of the power law relationship between international/domestic collaborative papers according to the S_p and the type of document.

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Appendix

See Table 5.

Table 5 List of management journals included in the study

No	Title	Country	Language	IST year published	Quartile
1	Journal of Applied Psychology	USA	English	1917	Q1
2	Harvard Business Review	USA	English	1922	Q1
3	Human Relations	UK	English	1947	Q1
4	Personnel Psychology	USA	English	1948	Q1
5	Operations Research	USA	English	1953	Q2
6	IEEE Transactions on Engineering Management	USA	English	1954	Q2
7	Management Science	USA	English	1954	Q1
8	Engineering Economist	USA	English	1955	Q3
9	Administrative Science Quarterly	USA	English	1956	Q1
10	California Management Review	USA	English	1958	Q3
11	Academy of Management Journal	USA	English	1958	Q1
12	Cornell Hospitality Quarterly	USA	English	1960	Q1
13	Journal of Management Studies	UK	English	1961	Q1
14	Management International Review	Germany	English	1961	Q3
15	Transportation Journal	USA	English	1961	Q4
16	Asia Pacific Journal of Human Resources	Australia	English	1962	Q4

Table 5 continued

No	Title	Country	Language	1ST year published	Quartile
17	Human Resource Management	USA	English	1962	Q2
18	Journal of Small Business Management	USA	English	1963	Q2
19	Journal of Supply Chain Management	USA	English	1965	Q1
20	Journal of Applied Behavioral Science	USA	English	1965	Q2
21	Management Decision	UK	English	1967	Q3
22	Socio-Economic Planning Sciences	UK	English	1967	Q3
23	Long Range Planning	UK	English	1968	Q1
24	Project Management Journal	USA	English	1970	Q2
25	Decision Sciences	USA	English	1970	Q2
26	Management Learning	UK	English	1970	Q2
27	South African Journal of Business Management	South Africa	English	1970	Q4
28	Journal of International Business Studies	UK	Multi-Language	1970	Q1
29	R&D Management	UK	English	1970	Q3
30	Industrial Marketing Management	USA	English	1971	Q2
31	Personnel Review	UK	English	1971	Q4
32	Interfaces	USA	English	1971	Q4
33	International Journal of Physical Distribution and Logistics Management	UK	English	1971	Q2
34	Research Policy	Netherlands	English	1972	Q1
35	Organizational Dynamics	USA	English	1973	Q4
36	Omega- International Journal of Management Science	UK	English	1973	Q1
37	Science and Public Policy	UK	English	1974	Q3
38	Journal of Management	USA	English	1975	Q1
39	Academy of Management Review	USA	English	1976	Q1
40	Journal of Technology Transfer	USA	English	1976	Q2
41	MIS Quarterly	USA	English	1977	Q1
42	Journal of Organizational Behavior Management	USA	English	1978	Q4
43	Journal of the Operational Research Society	UK	English	1978	Q3
44	Information and Management	Netherlands	English	1978	Q2
45	Research in Organizational Behavior	USA	English	1979	Q2
46	Employee Relations	UK	English	1979	Q3
47	Strategic Management Journal	USA	English	1980	Q1
48	Organization Studies	UK	English	1980	Q1
49	Technovation	Netherlands	English	1980	Q1
50	Journal of Business Logistics	USA	English	1980	Q1
51	International Journal of Manpower	UK	English	1980	Q4
52	Tourism Management	UK	English	1980	Q1

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